

**COMMONWEALTH OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

**NEPR**

**Received:**

**Aug 6, 2021**

**9:08 PM**

**IN RE: REVIEW OF PUERTO RICO  
ELECTRIC POWER AUTHORITY'S  
COMPREHENSIVE VEGETATION  
MANAGEMENT PROGRAM**

**CASE NO. NEPR-MI-2019-0005**

**SUBJECT: LUMA's Presentation for Virtual Technical  
Conference scheduled for August 13, 2021**

**MOTION SUBMITTING LUMA'S PRESENTATION FOR VIRTUAL TECHNICAL  
CONFERENCE SCHEDULED FOR AUGUST 13, 2021**

**TO THE HONORABLE PUERTO RICO ENERGY BUREAU:**

**COME NOW LUMA Energy, LLC** ("ManagementCo")<sup>1</sup>, and **LUMA Energy ServCo, LLC** ("ServCo")<sup>2</sup>, (jointly referred to as "LUMA"), and respectfully submit and request the following:

On April 11, 2021, LUMA filed with this Puerto Rico Energy Bureau ("Energy Bureau") a Petition submitting LUMA's proposed Vegetation Management Plan prepared pursuant to Section 4.2(h) of the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement dated as of June 22, 2020<sup>3</sup>, and in compliance with this Energy Bureau's Resolution and Order of December 31, 2020 in this proceeding.

On July 16, 2021, this Energy Bureau issued a Resolution and Order (the "July 16 Order") establishing a Procedural Calendar for the referenced proceeding, pursuant to which a Virtual Technical Conference to discuss LUMA's Vegetation Management Plan was scheduled for August

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<sup>1</sup> Register No. 439372.

<sup>2</sup> Register No. 439373.

<sup>3</sup> Executed by and among LUMA, the Puerto Rico Electric Power Authority, and the Puerto Rico Public Private Partnerships Authority.

13, 2021. The July 16 Order also required LUMA to submit to the Energy Bureau, on or before August 6, 2021, LUMA's Presentation for the Virtual Technical Conference.

In compliance with the July 16 Order, LUMA hereby submits, in pdf form, as Exhibit 1, the presentation that it proposes to offer during the Virtual Technical Conference of August 13, 2021 in the referenced proceeding.

**WHEREFORE**, LUMA respectfully requests that the Energy Bureau **accept** the presentation submitted as Exhibit 1 to this Motion that LUMA proposes to offer during the Virtual Technical Conference scheduled for August 13, 2021.

**RESPECTFULLY SUBMITTED.**

In San Juan, Puerto Rico, this 6<sup>th</sup> day of August 2021.

I hereby certify that I filed this Petition using the electronic filing system of this Energy Bureau and that I will send an electronic copy of this Motion to the attorneys for PREPA, Joannely Marrero-Cruz, [jmarrero@diazvaz.law](mailto:jmarrero@diazvaz.law); and Katuska Bolaños-Lugo, [kbolanos@diazvaz.law](mailto:kbolanos@diazvaz.law).



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## **Exhibit 1**

*Presentation in pdf format*



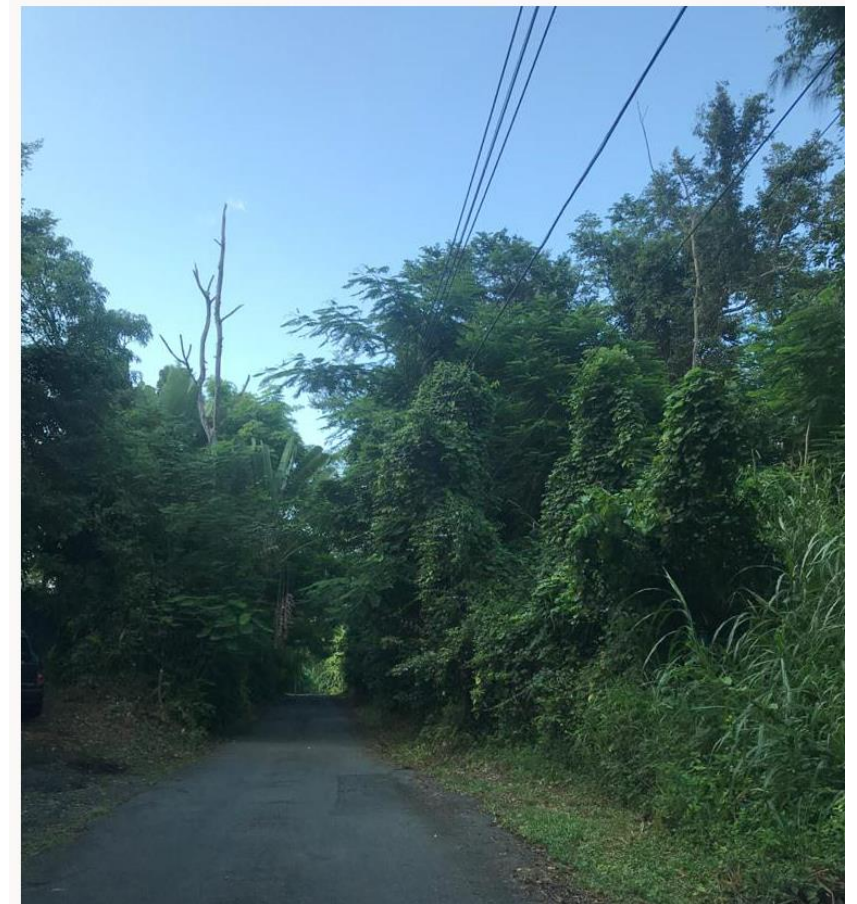
# Vegetation Management Plan Technical Conference

August 13, 2021



# Vegetation Management Plan

1. Introduction
2. Stakeholder Management
3. Applicable Laws, Regulations, and Industry Standards
4. Vegetation Management Vision, Values and Strategic Objectives
5. Critical Success Factors
6. Vegetation Management Organization
7. Physical Considerations
8. Integrated Vegetation Management
9. Vegetation Management Processes
10. Vegetation Maintenance Practices
11. Risk Management
12. Vegetation Management Improvement Plan
13. Investments and Expenditures



# Vegetation Management Plan

Purpose of Vegetation Management Plan:

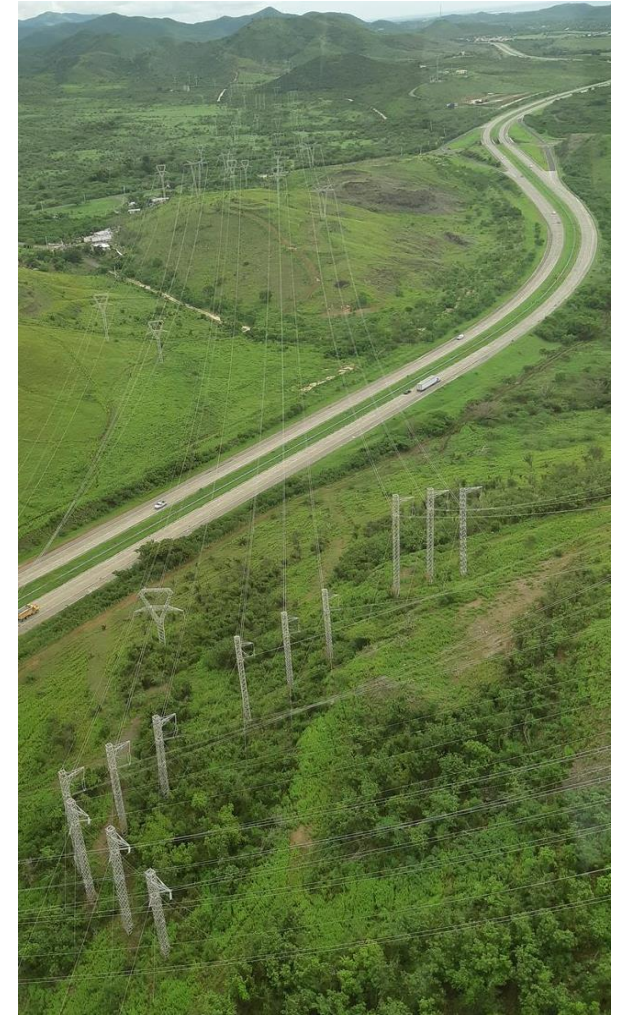
1. Establishes the basis for LUMA's Vegetation Management Program
2. Providing guidance for the management of the plan and organization

Two perspectives are presented in this plan:

1. Vegetation Management is strategic in nature, used to describe the elements and functions in LUMA's Vegetation Program moving forward
2. Vegetation Maintenance providing the tactical context and describing the control methods and practices required to execute the Vegetation Management strategy.

## 2. Stakeholder Management

- Federal Agencies
- Puerto Rican Government Agencies
- Puerto Rico Environmental Non-Profits
- Local Municipalities
- Professional Associations or Trade Groups
- Private Sector Stakeholders
- Academic Institutions
- Customer and Public Relations
- Puerto Rico's Environmental and Cultural Resources
- Commitment to Public Interaction, Demonstration of Stewardship and Vegetation Management Plan Sustainability
- Recognition Programs



# 3. Applicable Laws, Regulations, and Industry Standards

## Puerto Rico Laws

- Section 1.16 of the Puerto Rico Energy Public Policy Act, Act No. 17-2019,
  - Requires the operator of the transmission and distribution grid to prepare and present to the Puerto Rico Energy Bureau ("PREB") a comprehensive Vegetation Management Plan in accordance with best industry practices to protect the integrity of the grid.
  - Section 1.06(5) of Act 17-2019 also declares as an initial objective of Act 17-2019 to establish priorities for the maintenance of infrastructure of the electric system and create vegetation management plans.
- Puerto Rico Energy Transformation and RELIEF Act, Act 57-2014, Article 6.3 provides that PREB will oversee the compliance of T&D Operator with a vegetation management plan in accordance with best practices in the industry to protect the grid.



# 3. Applicable Laws, Regulations, and Industry Standards

## Applicable Regulations

Federal Lands Policy and Management Act of 1976

Endangered Species Act (ESA)

Clean Water Act

- Section 401 of the Clean Water Act regulating discharges into navigable waters.
- Section 402: Regulate storm water discharges associated with industrial activities under the National Pollutant Discharge Elimination System (NPDES).
- Section 404: Regulate discharges of dredged or fill material into waters of the U.S. (primarily regulated by the U.S. Army Corps of Engineers).

USDA Forest Service CFR 36 Part 251 Land Uses; Special Uses; Procedures for Operating Plans and Agreements for Powerline Facility Maintenance and Vegetation Management Within and Abutting the Linear Boundary of a Special Use Authorization for a Powerline Facility



# 3. Applicable Laws, Regulations, and Industry Standards

## Industry Best Practices

LUMA's Vegetation Management Plan seeks to incorporate the following industry standards and best practices:

- National Electric Safety Code, Rule 218 (2017)
- ANSI Z133 Safety Requirements for Arboricultural Operations (2017)
- ANSI A300 Tree, Shrub, and other Woody Plant Management-Standard Practices:
  - Part 1 Pruning (2014)
  - Part 7 Integrated Vegetation Management (2019)
  - Part 9 Tree Risk Assessment (2017)
- International Society of Arboriculture Best Management Practices
  - Tree Pruning (2019)
  - Utility Pruning of Trees (2004)
  - Tree Risk Assessment (2017)
  - Utility Tree Risk Assessment (2020)
  - Integrated Vegetation Management (2014)



# 4. Vegetation Management Visions, Policies & Goals

## LUMA's vision

- Provide safe and effective management of vegetation while maintaining harmonious relationships with adjoining land users and the environment. We will apply methods that are site sensitive, based on the best practices and scientific tree care research information available. In so doing, we seek to minimize impact to sensitive wildlife and plants, cultural resources, and other natural resources, while ensuring the safe and reliable operation of the electric system.

## Policy

- LUMA's Vegetation Management Plan is to support the reliable transmission and distribution of electric power in a safe, economically, ecologically, and environmentally sound manner. Stewardship and sustainability will be achieved through use of Integrated Vegetation Management.

## Goals

- Work Safety
- Safe & Reliable Service
- Cost Effective Service
- Support Development of On-island Capabilities

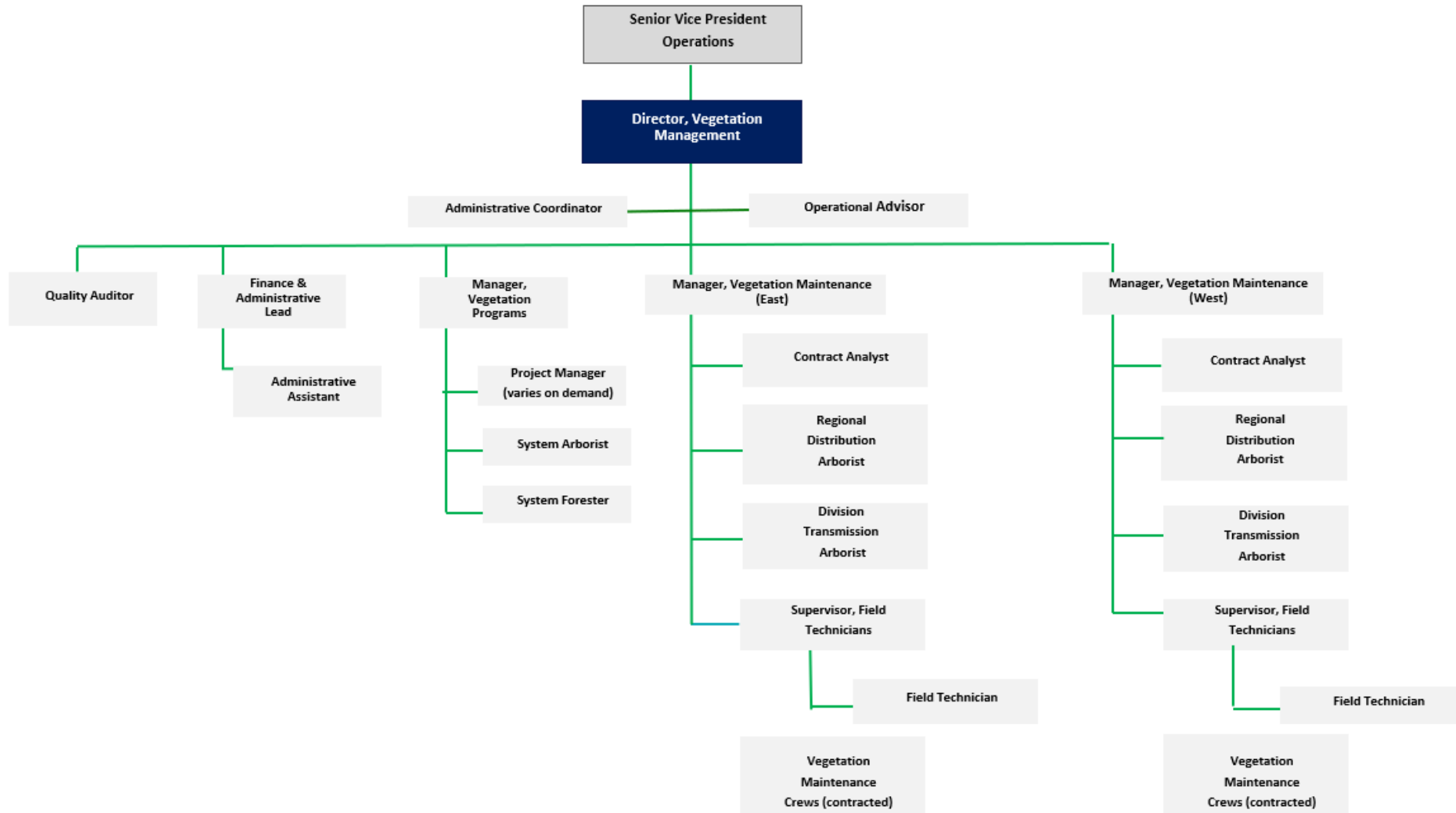


## 5. Critical Success Factors

- Centralized vegetation management team, staffed by professionals who can rapidly establish procedures and practices aimed at eliminating public endangerment and supporting a safe and efficient work environment.
- Effective use of funding dedicated to vegetation management
- Tree-conductor clearances are re-established
- Shift from a reactive and reclamation mode of operation to steady-state integrated vegetation management
- Fully deploying the principles of Integrated Vegetation Management
- Use of industry standards and best management practices to establish vegetation maintenance work expectations
- Formally establish process flows and standard approaches to efficiently manage and measure the performance of the various types of vegetation maintenance work
- Implementing a field enabled IT tool to manage vegetation maintenance work, including planning, scheduling, executing, and evaluating the effectiveness of vegetation maintenance activities



# 6. Vegetation Management Organization



# 7. Physical Considerations

LUMA's Vegetation Management Plan takes into consideration several physical aspects

- Transmission and Distribution System
- Tree Conductor Clearances
- Right Tree / Right Place



## 7. Physical Considerations

The PREPA Transmission and Distribution System includes approximately:

- 11,000 miles of overhead primary electric distribution lines
- 12,000 miles of low voltage secondary supply, individual service, and streetlighting lines
- 2,700 transmission lines
- 300 substation sites



# 7. Physical Considerations

## Distribution Clearances

- Required clearances are specified as part of the preventive maintenance prescriptions developed for each project.
- The Utility Vegetation Management industry recognizes in most jurisdictions incidental tree-conductor contact due to ingrowth will occur on a distribution circuit prior to scheduled preventive maintenance.
- The National Electric Safety code recognizes incidental contact as acceptable and does not create an expectation that utilities will maintain overhead distribution systems free of any tree contact.



## 7. Physical Considerations

### Distribution Clearances

- LUMA seeks to eliminate hard contacts between low voltage service wires and trees. This requires only incidental pruning of the tree and is accomplished during routine scheduled work on the primary lines.
- Vines climbing on structures and interfering with equipment also represent a significant risk to reliability and must also be maintained. Vines are cut and the stump is treated with herbicide.

**Table 7-6. Tree-Conductor Clearance Requirements, Reduction/Removal and Edge Zones**

Line Type	Voltage Class	Overcurrent Protection	Tree-conductor clearances <sup>[1]</sup> to be established	Overhang Clearances (tree-conductor)
Three-phase (3Ø)	7.6/13.2kV	Substation Breaker	12'	Ground to sky
Multi-phase (2-3Ø)	7.6/13.2kV	Reclosure, line fuse	12'	15'
Single phase (1Ø)	7.6/13.2kV	Lateral fuses	12'	12'
Three-phase (3Ø)	≤4.8/8.3kV	Substation Breaker	12'	12'
Multi-phase (2-3Ø)	≤4.8/8.3kV	Reclosure, line fuse	12'	12'
Single phase (1Ø)	≤4.8/8.3kV	Lateral fuses	12'	12'
Open wire Secondary	120/240V	Transformer fuse	5'	5'
Tri-plex Secondary	120/240V	Transformer fuse	5'	5'
Open wire service	120/240V	Transformer fuse	No Hard Contact	No Hard Contact
Tri-plex service	120/240V	Transformer fuse	No Hard Contact	No Hard Contact

<sup>[1]</sup> This is a value that PREPA has established and stated in their VM Plan documents. LUMA is using this as guidance, but not considering it a "not to violate" MVCD for the distribution system.



# 7. Physical Considerations

## Transmission Clearances

- Guidance on tree-conductor clearances within the Wire and Border Zones will be established at the time that vegetation maintenance work is performed, consistent with the criteria presented in Table 7-7.
- The intent is that sufficient clearance be achieved to assure reliable service during the interval between scheduled preventive maintenance actions.
- Clearance expectations on the transmission system are based on application of IVM concepts
- While the PREPA transmission system is not subject to NERC requirements, LUMA is voluntarily adopting several elements of NERC FAC-003.4 Transmission Vegetation Management.

**Table 7-7. Tree-Conductor Clearance Requirements, Wire and Boarder Zones**

Line Type	Voltage Class	Wire Zone Clearances	Edge Zone Clearances <sup>[1]</sup>	Overhang Clearances	FAC-003.4 MVCD <sup>[2]</sup>	ANSI Z133 MAD <sup>[3]</sup>
All types	230 kV	No Trees	20'	Ground to Sky	4.0-4.6'	7' 0"
All types	115 kV	No Trees	15'	Ground to Sky	1.9-2.0'	3' 11"
All types	38 kV	No Trees	12'	Ground to Sky	1'	2' 11"

<sup>[1]</sup> This is a value that PREPA has established and stated in their VM Plan documents. We are using this as guidance, but not considering it a "not to violate" MVCD

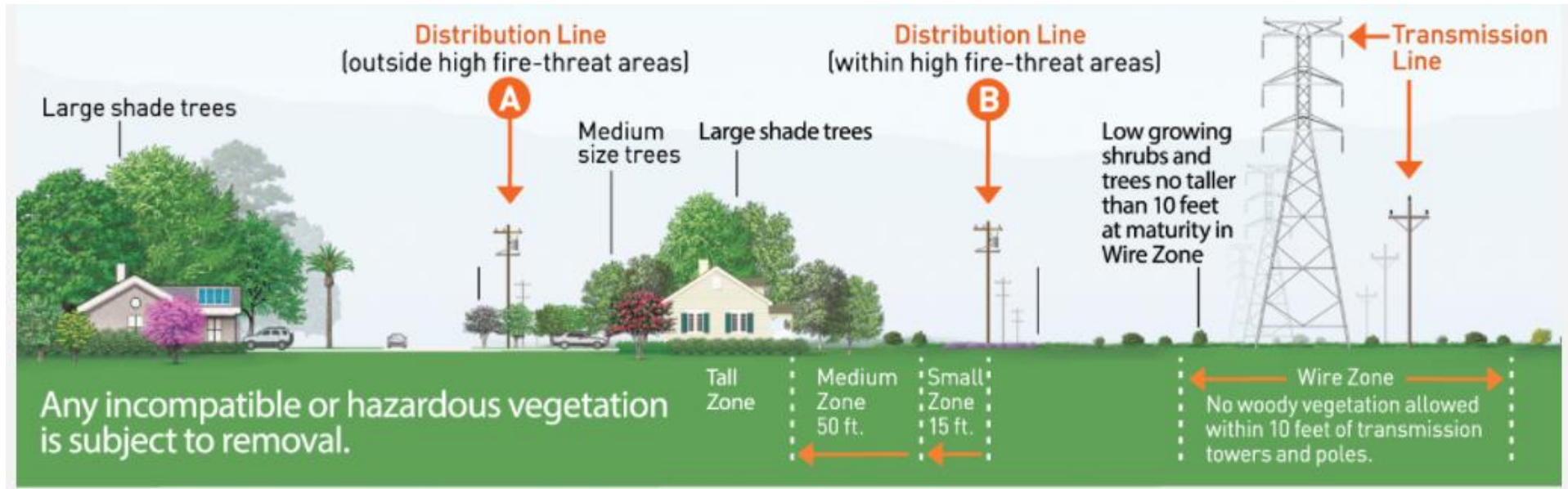
<sup>[2]</sup> Minimum Vegetation Clearance Distance, per NERC FAC-003.4

<sup>[3]</sup> Minimum Approach Distance for Qualified Line Clearance Arborists, per Table 2, ANSI Z-133



# 7. Physical Considerations

- Right Tree / Right Place
  - Arbor Day Foundation
  - Concept is to promote the planting and cultivation of trees to be properly placed to avoid collisions with power lines and buildings while increasing aesthetics and property values.



Source: PG&E's right tree, right place guidelines ([pge.com](http://pge.com))

## 8. Integrated Vegetation Management (IVM)

- IVM is a structured decision-making process which begins with gaining an understanding of the dynamics around incompatible species and the ecosystem. Management objectives are set using internal and external factors including reliability, regulatory compliance, site sensitivity or location, stakeholder considerations, and budgets.
- Vegetation maintenance treatment methods are then defined, recognizing the economic and environmental effects of the work, after which specific activities are planned, prescribed, and implemented based on site and project specific conditions.



## 8. Integrated Vegetation Management

- LUMA's Vegetation Management Plan applies this approach
- The objective is to ensure incompatible tall growing trees and woody plants do not interfere with critically important power facilities.
- Under an IVM operating model for electric utilities, the goal is to reduce the risk that an incompatible tree or plant species will adversely affect system operations.
- To the extent possible, incompatible plants are eliminated while preserving and enhancing low-growing compatible plant communities.
- These low-growing plant communities will compete with incompatible plants, providing a form of biological control. (Example: In the urban forest, promoting planting of more compact forms in place of tall growing landscape trees)
- LUMA expects by applying IVM, the cost and intensity of the vegetation work required will reduce over time while improving system reliability and safety. This approach will also provide safety, environmental, and social benefits.



## 8. Integrated Vegetation Management - Example

- The first step in establishing a meadow in the corridor is to reduce brush height to a manageable size.

*(As seen to the right: Heavy mulching mowers starting the process.)*



Source: Picture taken August 2012 of Dominion Energy transmission in Virginia

## 8. Integrated Vegetation Management - Example

- Previously mowed vegetation is allowed to regenerate.
- This ensured sufficient leaf surface area to allow sufficient herbicide uptake to control the rootstock of the plants.
- This corridor held low growing desirable species and incompatible/undesirable species.
- Selectively treating the target vegetation.

*(This photo was taken 13 months after clearing)*



Source: Picture taken September 2013 of Dominion Energy transmission in Virginia

## 8. Integrated Vegetation Management - Example

- The treated corridor transitioned with the seasonal leaf drop.
- There is no off site damage.
- (Purplish tinge of the desirable blueberry bushes scattered throughout can be seen the corridor

*(Photo taken in 3 months after selective herbicide treatment)*



*Source: Picture taken November 2013 of Dominion Energy transmission in Virginia*

## 8. Integrated Vegetation Management - Example

- Just two growing seasons after the initial mowing, shows a tremendous reduction in the stem count of the incompatible/undesirable species.
- Ongoing preventive maintenance will at a minimum involve spot treating target vegetation and a yearly tree risk assessment along on the corridor edges.

*(Photo taken 11 months after herbicide treatment)*



Source: Picture taken August 2014 of Dominion Energy transmission in Virginia

## 8. Integrated Vegetation Management - Example

Upon second treatment of herbicides in the corridor, local herbaceous grasses and forbs were naturally released. These forbs and grasses are great for local ecosystems and for local and transcendent pollinators.



# 9. Vegetation Management Processes

Vegetation maintenance represents a continuous and repetitive process. When trees are pruned, they re-grow, often with increased vigor, and when removed, others are recruited to fill the space created. Vegetation Maintenance includes addressing a myriad of post-vegetation maintenance activities.

**Table 9-1. General Classification of Vegetation Maintenance Work**

Vegetation Maintenance	General Characteristics
Reactive	Work that cannot be planned or scheduled but requires immediate attention. This work is typically related to service interruptions and outages.
Preventive	Work that can be specifically planned for and prioritized, scheduled, and managed on a project basis. It represents the largest portion of the Vegetation Management O&M budget.
Corrective	Work that is difficult to plan for, but once identified can be efficiently scheduled. This work is generated by customer requests, LUMA Operations and / or VM program staff. With an effective Preventive Maintenance process in place, a goal to limit this work to <10 percent of maintenance expenditures is reasonable.



# 9. Vegetation Management Processes

## Preventive Maintenance

Preventative Maintenance represents the cornerstone of LUMA's Vegetation Management Program. Vegetation management will work within the natural biological system to create sustainable conditions that can efficiently reduce risks posed by trees to the T&D system.

**Table 9-2. Factors Considered in Determining the Need for Preventive Maintenance**

Factor	Description
History	Time since previous maintenance
Projection	Anticipated preventive maintenance time frame
Performance	frequency of tree-initiated faults, interruptions, and outages, and related KPI's (LUMA contract compensatory e.g., SAIFI and SAIDI)
Infrastructure	Voltage, phases, construction framing, conductor type
Conditions	Field assessment of conditions by VM staff and Service Providers
Internal input	Input from LUMA Operations, and other LUMA functional departments
External input	Customer and stakeholder concerns
Construction	Plans for Utility Transformation and major (FMEA) capital projects
Criticality	Critical loads and customers, system stability, resilience, and redundancy



# 10. Vegetation Management Practices

LUMA's Vegetation maintenance practices support a long-term strategy to establish and maintain sustainable conditions on the Transmission and Distribution system. This is a fundamental concept central to IVM that recognizes that the response of natural systems to change is predictable

- **Biological Control Methods:** reflected in both physical and chemical controls, reducing the amount of human intervention in future years.
- **Physical Control Methods:** Pruning or removal of tall growing trees and vines in proximity of distribution facilities and along transmission corridors deemed incompatible with the safe and reliable operation of the power system.
- **Chemical Control Methods:** Applying registered herbicides, eliminating incompatible stems from a site, encouraging the establishment and expansion of compatible plant cover, and thus suppressing the growth of incompatible species.



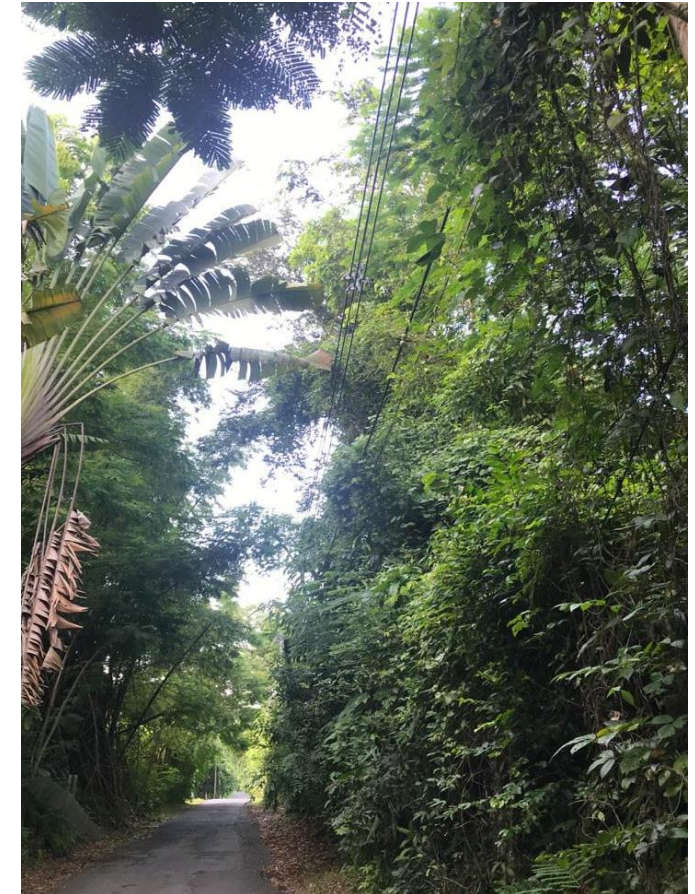
# 11. Risk Management

Vegetation Management plan is a blend of “take-over,” risk remediation, and “business-as-usual” plans. Therefore, there is a certain amount of embedded risk attributable to the:

- Pure magnitude of the Vegetation Management practices / processes shortcomings (i.e., gaps) between PREPA’s current state and that of representative of industry norms, and
- The extremely poor reliability with SAIFI and SAIDI values buried in the fourth quartile, half of which is estimated to be attributed to tree-caused outages.

The System Remediation Plan includes programs to address both aspects, seeks to abate or mitigate immediate vegetation management-related risk in the most critical locations, along with an ongoing program to clear and re-establish rights-of-way (ROW) to standard widths.

Along with reclaiming rights-of-way corridors, the remediation element of this plan calls for a field enabled IT tool to manage the program, along with ongoing line clearance, pruning, tree removal, the use of herbicides, etc. and vegetation management training.



# 11. Risk Management

Gap Assessment	Current Progress	Desired State
<ul style="list-style-type: none"> <li>• De-centralized program</li> <li>• No Regular Focus on Vegetation Management</li> <li>• Limited use of industry standards</li> <li>• Limited use of best management practices</li> <li>• Deferred vegetation maintenance</li> <li>• Predominantly reactive or corrective maintenance</li> <li>• Equipment in poor repair</li> <li>• Scarcity of specialized equipment</li> <li>• Little use of herbicides</li> <li>• No use of tree growth regulator</li> </ul>	<ul style="list-style-type: none"> <li>• Centralize Vegetation Management Team</li> <li>• Implementing and promoting of industry standards</li> <li>• Promoting safe and efficient work</li> <li>• Reactive maintenance response initiative targeting greatest risk to safety &amp; reliability</li> </ul>	<ul style="list-style-type: none"> <li>• Centralized Vegetation Management Team of subject matter experts</li> <li>• Program guided on current industry best practices</li> <li>• Program based on Integrated Vegetation Management (IVM)</li> <li>• Standardize work flows and practices</li> <li>• Performance measurement and quality systems</li> <li>• Reclaim existing rights of way</li> <li>• Implement IT work management tool</li> <li>• Establish a vegetation management field work force capable</li> </ul>

# 12. Vegetation Management Improvement Plan

## Vegetation Management's Operational Phases

<b>RAPID REACTIVE RESPONSE</b>	Intended to identify the “worst of the worst” condition on the Transmission and Distribution system Presents risk to safety, reliability, and constrains system capacity.
<b>RECLAMATION OF RIGHTS OF WAY</b>	Reclaim the ROW and reestablish conditions reasonably maintainable by the systematic application of preventive maintenance practices.
<b>PREVENTIVE VEGETATION MAINTENANCE</b>	Once the ROW is reclaimed, intent is to control incompatible vegetation which poses risks to safety, reliability, and system capacity. The previously described IVM-based approach is intended to manage tree and plant community response in a manner that reduces, over time, the intensity of preventive maintenance work.

## SUPPLEMENTAL VEGETATION ACTIVITIES

<b>CORRECTIVE VEGETATION MAINTENANCE</b>	Corrective vegetation maintenance will be performed as necessary when a site-specific need for vegetation maintenance is identified by LUMA or in response to customer requests.
<b>REACTIVE VEGETATION MAINTENANCE</b>	Response to tree-initiated faults, interruptions, and outages; as well as provide necessary access. Tree crews are an important resource to Line Operations in their effort to respond, restore, and repair tree-related damage to energy delivery infrastructure.
<b>PRIORITIZE SAFETY</b>	Address the backlog of untrimmed trees request from LUMA customers which may be public safety risks or potentially cause power outages.



# 12. Vegetation Management Improvement Plan

Rapid Reactive Response	ROW Reclamation	Steady State Preventive Maintenance
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Figure 12-3. Conceptual Schedule for 3-Phased VM Plan Implementation

line type	miles	Yr. 1 Q1	Yr. 1 Q2	Yr. 1 Q3	Yr. 1 Q4	Yr. 2 Q1	Yr. 2 Q2	Yr. 2 Q3	Yr. 2 Q4	Yr. 3 Q1	Yr. 3 Q2	Yr. 3 Q3	Yr. 3 Q4	Yr. 4 Q1	Yr. 4 Q2	Yr. 4 Q3	Yr. 4 Q4	Yr. 5 Q1	Yr. 5 Q2	Yr. 5 Q3	Yr. 5 Q4
230kV	398																				
230kV	398	Existing URBAN ROW will require acquisition of additional widening.																			
115kV	546																				
115kV	546	Existing URBAN ROW will require acquisition of additional widening.																			
115kV	546																				
38kV	1172																				
		Existing URBAN ROW will require acquisition of additional widening.																			
15kV 3Ø	2355																				
		Will involve "pushing" ROW edge out but not to the extent that additional width be formally established by easement.																			
15kV 1Ø	3048																				
5kV 3Ø	2455																				
5kV 1Ø	4760																				
		Will involve "pushing" ROW cleared corridor edge out.																			

# 13. Investments and Expenditures

- Annual spending levels (mostly O&M) will reach \$60.0 million until LUMA (1) reaches the remediated state, and (2) gains experiential knowledge (supported by accurate cost and performance data) of the effort required to effectively manage and maintain vegetation within its service territory.
- The initial budget establishes five projects, focused on initial remediation
  - Reactive Response
  - Reclamation of the T&D System ROW
  - Steady state preventive maintenance
  - VM Information Technology
  - VM Advanced Technology





Thank you

